

## PATENT COOPERATION TREATY

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## INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

(Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)

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| Applicant's or agent's file reference<br>P1056PC00-JOO   | <b>FOR FURTHER ACTION</b><br>See Form PCT/PEA/416   |  |
| International application No.<br>PCT/NO2004/000357   | International filing date (day/month/year)<br>22.11.2004  | Priority date (day/month/year)<br>21.11.2003 |
| International Patent Classification (IPC) or national classification and IPC<br>INV. E21B33/12   |   |  |
| Applicant<br>TC PLUG TECHNOLOGY A.S. et al.  |   |  |
| <p>1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.</p> <p>2. This REPORT consists of a total of 5 sheets, including this cover sheet.</p> <p>3. This report is also accompanied by ANNEXES, comprising:</p> <p>a. <input checked="" type="checkbox"/> sent to the applicant and to the International Bureau) a total of 3 sheets, as follows:</p> <p><input checked="" type="checkbox"/> sheets of the description, claims and/or drawings which have been amended and are the basis of this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).</p> <p><input type="checkbox"/> sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box.</p> <p>b. <input type="checkbox"/> (sent to the International Bureau only) a total of (indicate type and number of electronic carrier(s)) , containing a sequence listing and/or tables related thereto, in electronic form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).</p> |   |  |
| <p>4. This report contains indications relating to the following items:</p> <p><input checked="" type="checkbox"/> Box No. I Basis of the report</p> <p><input type="checkbox"/> Box No. II Priority</p> <p><input type="checkbox"/> Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability</p> <p><input type="checkbox"/> Box No. IV Lack of unity of invention</p> <p><input checked="" type="checkbox"/> Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement</p> <p><input type="checkbox"/> Box No. VI Certain documents cited</p> <p><input type="checkbox"/> Box No. VII Certain defects in the international application</p> <p><input type="checkbox"/> Box No. VIII Certain observations on the international application</p>  |   |  |
| Date of submission of the demand<br><br>17.06.2005   | Date of completion of this report<br><br>05.04.2006   |  |
| Name and mailing address of the International preliminary examining authority:<br><br> European Patent Office<br>D-80298 Munich<br>Tel. +49 89 2399 - 0 Tx: 523656 epmu d<br>Fax: +49 89 2399 - 4465  | Authorized officer<br><br>Diaz y Diaz-Caneja,<br><br>Telephone No. +49 89 2399-7534  |  |

**INTERNATIONAL PRELIMINARY REPORT  
ON PATENTABILITY**

International application No.  
PCT/NO2004/000357

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**Box No. I Basis of the report**

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1. With regard to the **language**, this report is based on the international application in the language in which it was filed, unless otherwise indicated under this item.
- ☐ This report is based on translations from the original language into the following language , which is the language of a translation furnished for the purposes of:
- ☐ international search (under Rules 12.3 and 23.1(b))
  - ☐ publication of the international application (under Rule 12.4)
  - ☐ international preliminary examination (under Rules 55.2 and/or 55.3)
2. With regard to the **elements\*** of the international application, this report is based on *(replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report):*

**Description, Pages**

1-10 as originally filed

**Claims, Numbers**

1-24 filed with telefax on 21.09.2005

**Drawings, Sheets**

1/3-3/3 as originally filed

- ☐ a sequence listing and/or any related table(s) - see Supplemental Box Relating to Sequence Listing

3. ☐ The amendments have resulted in the cancellation of:

- ☐ the description, pages
- ☐ the claims, Nos.
- ☐ the drawings, sheets/figs
- ☐ the sequence listing (*specify*):
- ☐ any table(s) related to sequence listing (*specify*):

4. ☐ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).

- ☐ the description, pages
- ☐ the claims, Nos.
- ☐ the drawings, sheets/figs
- ☐ the sequence listing (*specify*):
- ☐ any table(s) related to sequence listing (*specify*):

\* If item 4 applies, some or all of these sheets may be marked "superseded."

**INTERNATIONAL PRELIMINARY REPORT  
ON PATENTABILITY**

International application No.  
PCT/NO2004/000357

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**Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

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1. Statement

|                               |             |                  |
|-------------------------------|-------------|------------------|
| Novelty (N)                   | Yes: Claims | 1-24             |
|                               | No: Claims  |                  |
| Inventive step (IS)           | Yes: Claims | 3, 12, 13        |
|                               | No: Claims  | 1-2, 4-11, 14-24 |
| Industrial applicability (IA) | Yes: Claims | 1-24             |
|                               | No: Claims  |                  |

2. Citations and explanations (Rule 70.7):

**see separate sheet**

- 1) Reference is made to the following documents:

D1: WO 01 77484 A1

D2: US-A-5 607 017

- 2) D1 discloses a device for pressure testing of bore holes and the like in a formation or the like and associated pipe in which the plug 40 is installed in a plug carrying chamber 42, wherein a number of layer-formed disc elements 44 of a given thickness (implicitly disclosed), the one fitted on top of the other (see fig. 3).

The subject-matter of claim 1 therefore differs from this known device of D1 in that:

the plug seals off the passage through the pipe by cooperating with sealing bodies, as the underside of the plug is arranged in a seat at the bottom of the chamber.

The problem to be solved by these features may therefore be regarded as to provide a better seal between the pipe and the plug.

The same problem is however solved by the same means in D2, which discloses a sheath 26 to cooperate with the tubing section (see column 2, lines 55-59) and seats 24. A gasket can have different thicknesses and can be a film of paper in some cases as in claim 2.

As no inventive step can be seen in adding the sheath and the seats of D2 to the device of D1, no inventive step can be seen in the subject-matter of claim 1 (Art. 52(1) and 56 EPC).

- 3) The additional features of claim 2 are known from D1, see item 44.

Thus, the subject-matter of claim 2 does not involve an inventive step (Art.33(3) PCT).

- 4) The combination of the ~~features of dependent~~ claim 3 is neither known from, nor rendered obvious by, the available prior art. The features of claim 3 are not known from D1 and would impart strength to the plug.

Also the combination of the features of claim 12 is not known from claim D1. Claim 12 discloses that the sealing bodies are arranged inside the pipe, this gives a reduced

load to the plug.

- 5) The unit bar employed on pages 3, 5 and 8 is not recognized in international practice, contrary to the requirements of Rule 10.1(d) PCT.
- 6) Following should had been taken into account:
  - Rule 6.3 (b) PCT: correct two-part form of independant claim 1 with regard to D1 and D2.
  - Rule 6.2 (b) PCT.  
The subject-matter of the independant claims should include some technical difference over the disclosure of documents D1 and D2, considered in combination, so as to permit a finding that that claim has inventive step over the prior art.
  - Rule 5.1 (a) (iii) PCT: description in conformity with the new claims.
  - Art. 34 (2) (b) PCT: The applicants are requested to identify in their reply those passages of the application as originally filed which form a basis for the amendments.

### PATENT CLAIMS

1. Device for a crushable plug (12), arranged for pressure testing of bore holes in a formation, comprising a pipe in which the plug, with a number of layer-formed or tier-formed glass ring disc elements of a given thickness, the one fitted on top of the other, is installed in a plug-carrying chamber, and the plug seals off the passage through the pipe by cooperating with sealing bodies, as the underside of the plug is arranged (rests) in a seat of the chamber, characterised in that a film or a sheet of a material other than glass is inserted between the different layers of the plug to obtain the required strength and toughness.
2. Device according to claims 1, characterised in that the inserted film comprises a plastic film, a felt film, a paper film or the like.
3. Device according to claims 1-2, characterised in that the glass discs are joined together by lamination with a binding agent such as a glue.
4. Device according to any of the preceding claims, characterised in that the glass discs are hardened or brittle, so that one gets a simple and effective mechanical crushing of the glass.
5. Device according to any of the preceding claims, characterised in that the glass is formed with a polished surface to obtain a satisfactory seal between each glass disc and between the outer surfaces of the glass and the metal of the inner wall of the pipe.
6. Device according to any of the preceding claims, characterised in that the glass plug is placed in a frame or a crib of a ~~high-grade material~~ (37), such as a softer metal such as bronze to safeguard the plug against damage from rough treatment.
7. Device according to any of the preceding claims, characterised in that one type of glass (32,34) accounts for pressure sealing while another type of glass. (16,15) handles pressure load as a consequence of the liquid pressure.

8. Device according to any of the preceding claims, characterised in that the glass plug is arranged to be removed with the help of an explosive charge (40) which is fastened to the glass in, or on, the inside of the plug housing/pipe section.
9. Device according to any of the preceding claims, characterised in that the explosive charge of the glass plug is arranged inside a separate glass disc (42) that lies on top of and close to the sealing end disc (32).
10. Device according to any of the preceding claims, characterised in that a number of layers (X) are manufactured as disc-formed plates, and also upper and lower obliqued plates (15, 17.Y), and also that placed in each end of the plug are end-sections (32, 34) which comprise their own sealing bodies comprising a sealing body (23, 25) that forms the plug's sealing against the inner wall of the pipe (10) to prevent leaks.
11. Device according to claim 10; characterised in that a chamber (30) forms a correspondingly obliqued seat (18) for a reciprocally shaped seat top side of the plug that has an angle of contact with the seat of about 45°.
12. Device according to any of the preceding claims, characterised in that the sealing bodies (23, 25) are arranged in connection with the inner wall of the pipe (10) above (upstream) and/or below (downstream) the chamber (30) and are arranged to form a seal against the respective cylindrical extensions (32, 34) of the plug body (10) above and/or below the chamber.
13. Device according to claim 12, characterised in that each sealing body (23, 25) comprises a seal such as, for example, an O-ring that is fitted in the ring-formed recesses in the inner wall of the pipe.
14. Device according to any of the preceding claims, characterised in that the separate section is divided into two part sections (52, 54) each containing an explosive charge (56, 58).
15. Device according to any of the preceding claims, characterised in that the plug housing comprises a permanently situated "No-Go" shoulder in the form of a ring-formed inwardly facing fold or "shelf" (40) in the pipe to be able to simply place mechanical plugs to carry out testing or safeguarding of the well later.

16. Device according to any of the preceding claims, characterised in that the pipe section/housing or the glass holder is shaped with an venting hole (36) to simplify the installation of the glass discs.

17. Device according to any of the preceding claims, characterised in that the hole (36) is used for pressure balancing to reduce the pressure load on the plug.

18. Device according to any of the preceding claims, characterised in that a recess (14) for the glass is made so that one can easily drive equipment through after the glass plug is removed such that corners and form are shaped such that tools do not get stuck.

19. Device according to claim 18, characterised in that the recess (14) for the glass can be used for suspending plugs or other equipment after the glass has been removed, for example, in later well operations.

20. Device according to claim 18, characterised in that the recess (14) for the glass and the area around is formed so that one can suspend plugs or other equipment in the same recess and establish both anchorage and sealing in this area at later well operations.

21. Device for a pipe section for taking up a plug, characterised in that it is formed as described in the above mentioned claims.

22. Device according to claim 22, characterised in that the plug housing comprises a permanent situated "No-Go" shoulder in the form of a ring-formed inwardly facing fold or "shelf" (40) in the pipe, to make it simple to place mechanical plugs to carry out testing or safeguarding of the well later.

23. Device according to any of the preceding claims 21-22, characterised in that the recess (14) for the glass and also the shoulder section (46) is used to suspend plugs or other equipment after the glass is removed, for example, at later well operations.

24. Device according to any of the preceding claims 21-23, characterised in that the recess (14) for the glass and also the shoulder section (46) and the area around is formed so that one can suspend plugs or other equipment in the same recess and establish both anchorage and sealing in this area for later well operations.